

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
GCSE**

**A161/01**

**TWENTY FIRST CENTURY SCIENCE  
BIOLOGY A/SCIENCE A**

**Modules B1 B2 B3 (Foundation Tier)**

**TUESDAY 13 MAY 2014: Morning**

**DURATION: 1 hour**

**plus your additional time allowance**

**MODIFIED ENLARGED**

<b>Candidate forename</b>		<b>Candidate surname</b>	
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<b>Centre number</b>						<b>Candidate number</b>				
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**Candidates answer on the Question Paper.  
A calculator may be used for this paper.**

**OCR SUPPLIED MATERIALS:**

**None**

**OTHER MATERIALS REQUIRED:**

**Pencil**

**Ruler (cm/mm)**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

**Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**

**Use black ink. HB pencil may be used for graphs and diagrams only.**

**Answer ALL the questions.**

**Read each question carefully. Make sure you know what you have to do before starting your answer.**

**Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).**

## **INFORMATION FOR CANDIDATES**

**The quality of written communication is assessed in questions marked with a pencil ().**

**The number of marks is given in brackets [ ] at the end of each question or part question.**

**The total number of marks for this paper is 60.**

**Any blank pages are indicated.**

**BLANK PAGE**

**Answer ALL the questions.**

- 1 (a) Cystic fibrosis is an inherited disorder.**

**People with cystic fibrosis show symptoms of the disorder.**

**Put ticks (✓) in the boxes next to TWO symptoms of cystic fibrosis.**

**memory loss**

☐

**clumsiness**

☐

**problems with digesting food**

☐

**production of thick mucus**

☐

**not able to concentrate**

☐

**[2]**

**(b) Sharon and Eric are both carriers for cystic fibrosis.**

**Sharon is pregnant. Eric is the father of the baby.**

**(i) Complete the diagram to show the possible combinations of alleles for their baby.**

**KEY**

**T = normal allele**

**t = cystic fibrosis allele**

		Sharon	
		T	.....
Eric	T		
	.....		

**[2]**

**(ii) Calculate the probability that the baby will have cystic fibrosis.**

**probability of  
baby having  
cystic fibrosis = \_\_\_\_\_ [1]**

**(c) Sharon and Eric discuss whether to have their fetus (unborn baby) tested.**

**This is what they discuss.**

- A The results of the test might not be accurate.**
- B The test will enable us to plan treatment if the fetus has cystic fibrosis.**
- C Cystic fibrosis is a serious disease.**
- D We would rather not know whether our baby has cystic fibrosis.**
- E The test is painful for the mother.**

**Sharon and Eric decide to have their fetus tested.**



**Use the ideas of benefit and risk to suggest why they made that decision.**

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**[2]**

**(d) Some people do not agree with fetal testing.**

**Suggest why.**

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**[1]**

**[TOTAL: 8]**

- 2 (a) Write down the combination of sex chromosomes in the body cells of human males and females.**

**males** \_\_\_\_\_

**females** \_\_\_\_\_

**[1]**

- (b) (i) In the UK, the expected ratio of male to female births is 1 : 1.**

**2000 babies are born at one hospital in a year.**

**How many of these would you expect to be female?**

**answer =** \_\_\_\_\_ **[1]**

- (ii) In another country, the ratio of males to females born is 1.2 : 1.**

**1000 females are born in a day.**

**Calculate how many males you would expect to be born on the same day.**

**Show your working.**

**answer = \_\_\_\_\_ [2]**

- (iii) Suggest why the ratio of males to females born in some countries is 1.2 : 1.**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

**[TOTAL: 6]**

### **3 Everyone has different characteristics.**

**This means we all look and behave differently.**

**Explain how our characteristics are determined.**

**Include specific examples of characteristics in your answer. [6]**



**The quality of written communication will be assessed in your answer.**

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**[TOTAL: 6]**

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**4 Ian decides to join a running club.**

**At the first session, the instructor takes Ian's resting pulse rate.**

**(a) Explain how the instructor would measure Ian's pulse rate.**

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**[1]**

**(b) The instructor wants to work out how much blood the heart pumps out in a minute.**

**This is called cardiac output.**

**He uses this formula.**

$$\text{cardiac output} = \text{pulse rate} \times \text{volume of blood pumped out per heart beat}$$

**The results for Ian and three other members of the running club are shown in the table.**

<b>Name</b>	<b>Resting pulse rate in beats per minute</b>	<b>Volume of blood pumped out per heart beat in cm<sup>3</sup></b>	<b>Cardiac output in cm<sup>3</sup> per minute</b>
<b>Alistair</b>	<b>80</b>	<b>75</b>	<b>6000</b>
<b>Byron</b>	<b>68</b>	<b>80</b>	<b>5440</b>
<b>Colin</b>	<b>71</b>	<b>70</b>	<b>4970</b>
<b>Ian</b>	<b>75</b>	<b>92</b>	



**(i) Complete the table by calculating Ian's cardiac output.**

**[1]**

**(ii) Write down the range of the cardiac output measurements for these members of the running club.**

**range = \_\_\_\_\_ to \_\_\_\_\_**

**[1]**

- (iii) The instructor says that resting pulse rate is a good indicator of the level of fitness.

The lower your resting pulse rate the fitter you are.

From the data, put the men in order of fitness from the least fit to the most fit.

least fit \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

most fit \_\_\_\_\_

[1]

- (iv) The instructor thinks that the order of fitness may be incorrect.**

**Which TWO reasons, when taken together, explain why the order may be incorrect?**

**Put ticks (✓) in the boxes next to the TWO most likely reasons.**

**Ian has only just joined the running club.**

☐

**The measurements were only recorded once.**

☐

**A person's pulse rate may vary.**

☐

**Blood pressure measurements were not recorded.**

☐

**The men had different diets.**

☐

**[2]**

**[TOTAL: 6]**

**5 Helen is investigating the effect of antibiotics on the growth of bacteria.**

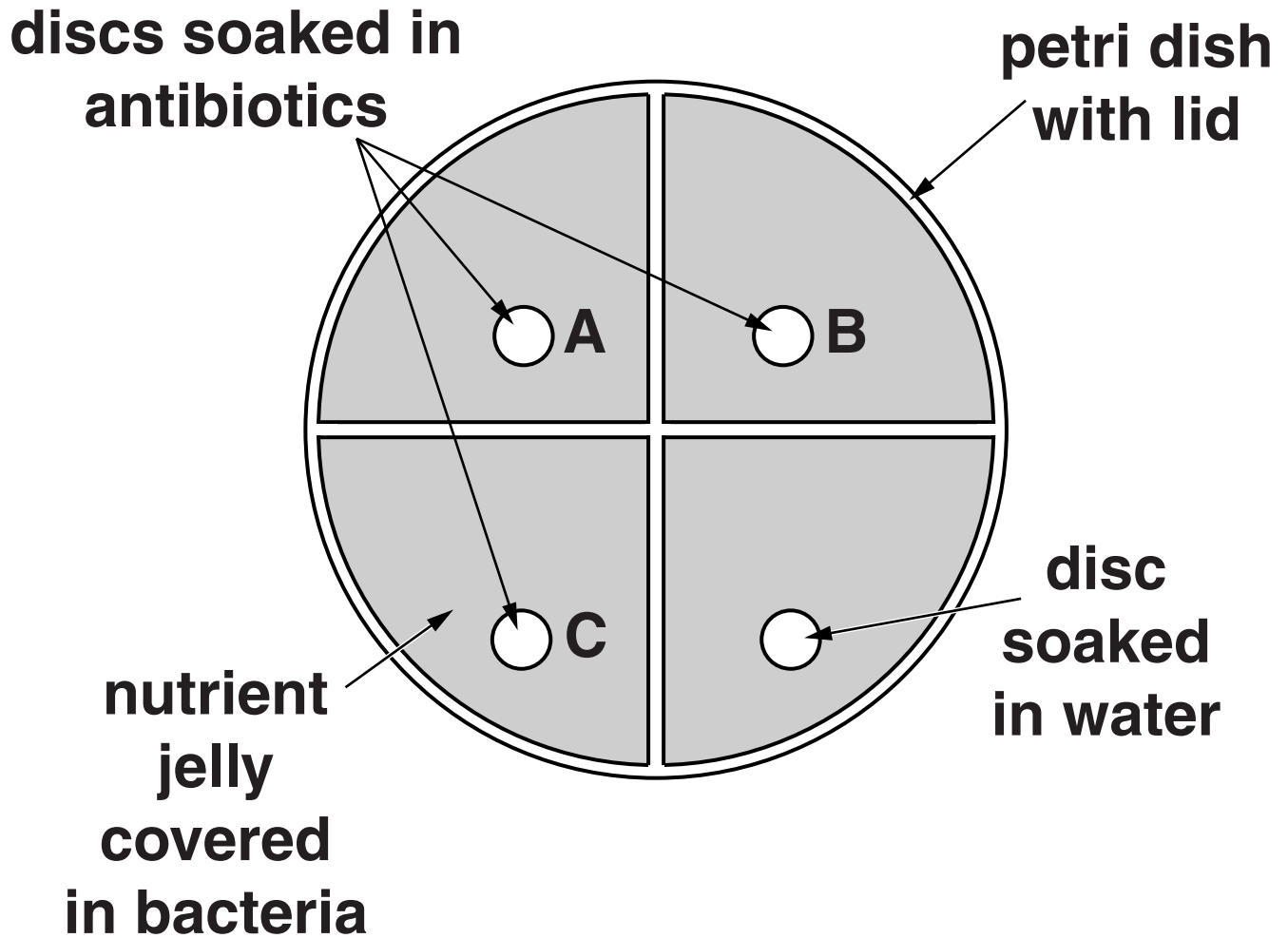
**Bacteria are grown on nutrient jelly.  
This makes the jelly look cloudy.**

**Helen puts a small paper disc into each of three different antibiotic solutions, A, B and C.**

**She puts another paper disc into water.**

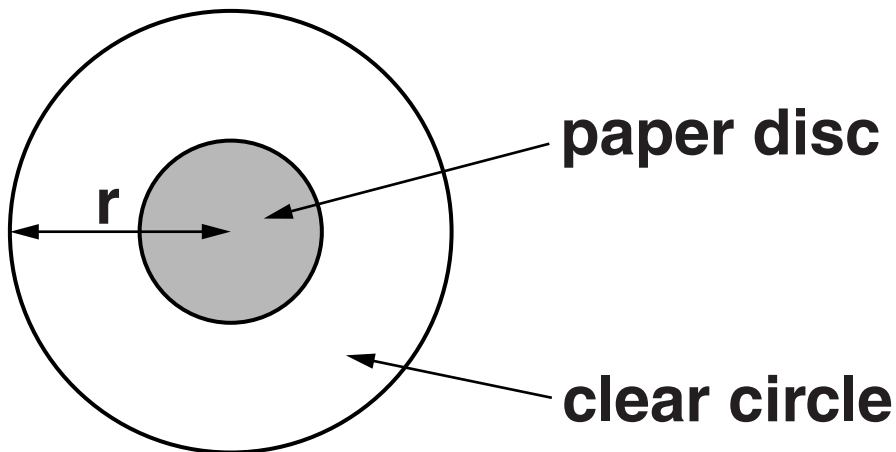
**She then places all of the paper discs onto the nutrient jelly.**

**The diagram shows the apparatus she uses for her investigation.**



**After two days Helen sees clear circular areas around some of the paper discs.**

**Helen measures the radius (r) as shown in the diagram.**



**She then calculates the total area of the clear circle (including the paper disc) using the formula:**

$$\text{area} = \pi r^2 \quad (\text{where } \pi = 3.14).$$

**Here are her results.**

	<b>Radius in mm</b>	<b>Total area of the clear circle (including the paper disc) in mm<sup>2</sup></b>
<b>A</b>	<b>8</b>	
<b>B</b>	<b>14</b>	<b>615.44</b>
<b>C</b>	<b>3</b>	<b>28.26</b>
<b>water</b>	<b>3</b>	<b>28.26</b>

**(a) Complete the table by calculating the total area of the clear circle (including the paper disc) for A.**

**Show your working below.**

**[2]**

**(b) The clear areas on the nutrient jelly are where the bacteria have been killed by the antibiotic.**

**Helen makes the following conclusions from her results.**

**Which of these conclusions are correct?**



**Put ticks (✓) in the boxes next to the  
THREE correct conclusions.**

**The greater the clear area,  
the more bacteria have died.**

☐

**The bacteria may be  
resistant to antibiotic C.**

☐

**Antibiotic A is the least  
effective.**

☐

**Water kills more bacteria  
than any antibiotic.**

☐

**Antibiotic C must be water.**

☐

**Antibiotic B is the most  
effective.**

☐

**[3]**

**(c) Explain why it is important for all the paper discs to be the same size.**

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**[2]**

**(d) New antibiotics must be tested before they can be made available to the general public.**

**Write down ONE reason why.**

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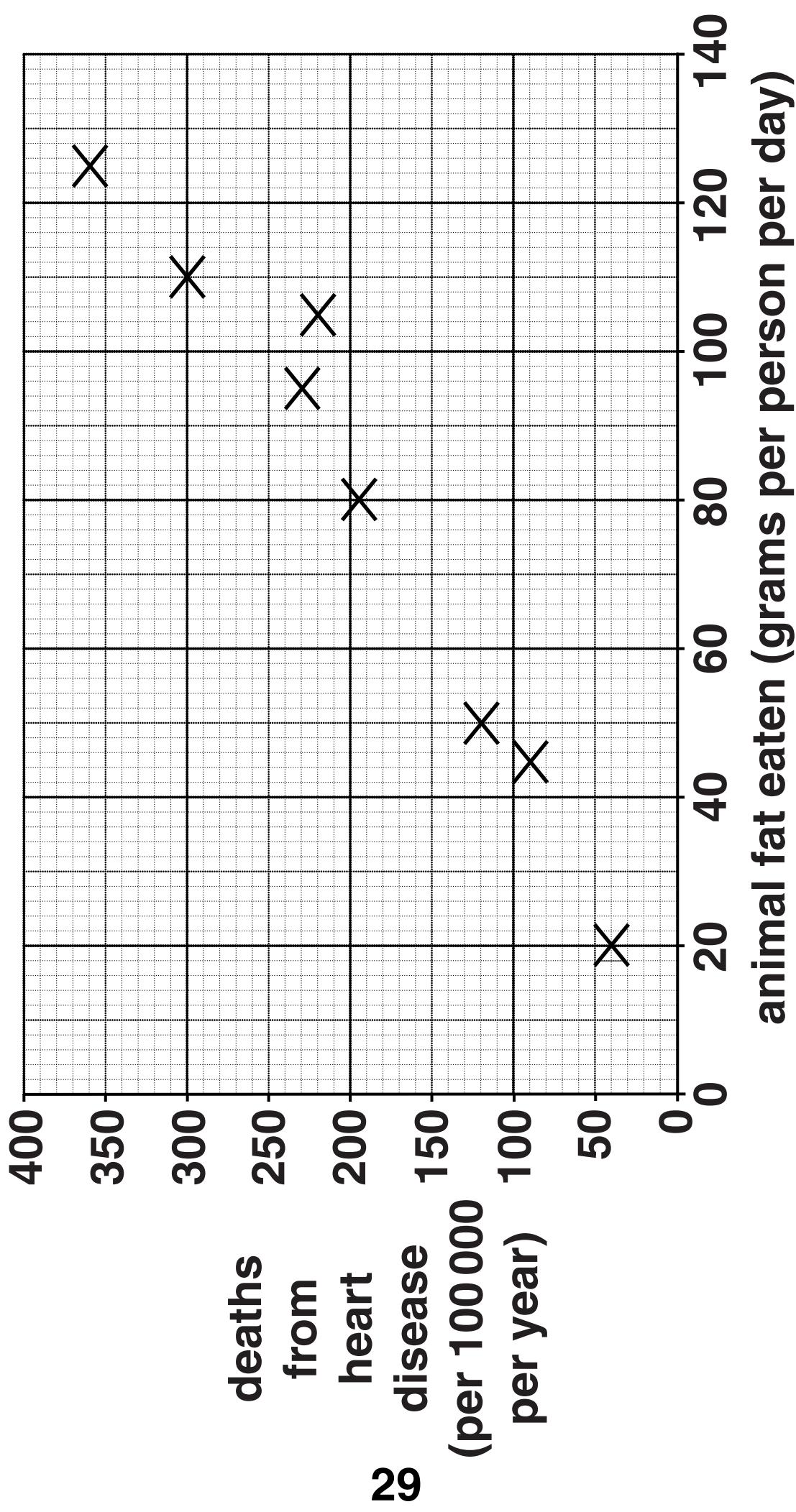
**[1]**

**[TOTAL: 8]**

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**6 A correlation is a relationship between a factor and an outcome.**

**Look at the graph opposite. Each cross on the graph represents data from a different country.**



**Describe the correlation shown in the graph on page 29.**

**Suggest other factors that have a similar correlation with deaths from heart disease.**

**[6]**



**The quality of written communication will be assessed in your answer.**

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**[TOTAL: 6]**

**7 Species that no longer exist are said to be extinct.**

**The graph shows the estimated total number of extinctions worldwide since 1800.**

**(a) (i) Describe the pattern shown by the graph opposite.**

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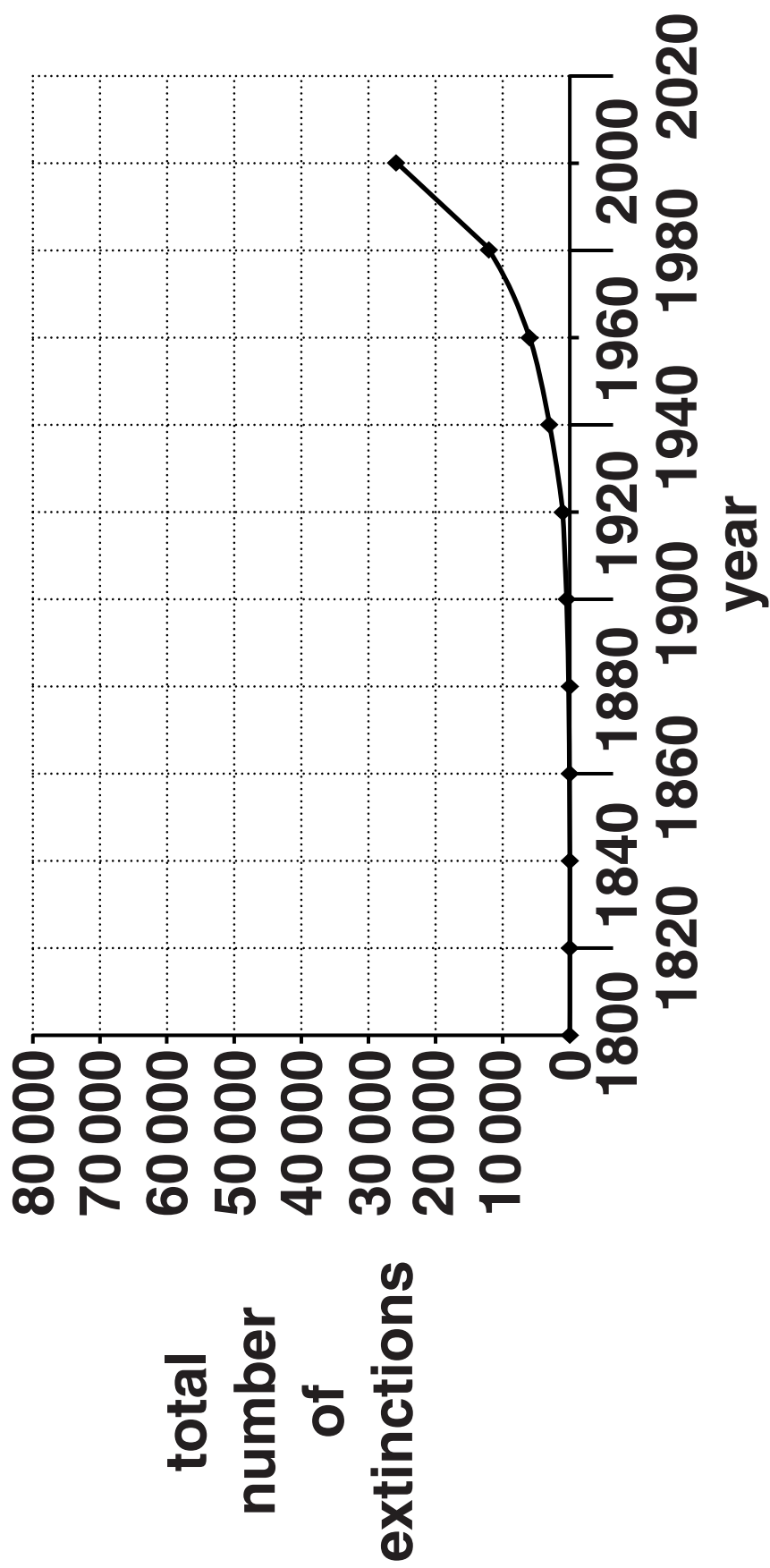
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[2]

**(ii) Continue the line on the graph to predict how many species are likely to have become extinct by 2020.**

**number of extinct species by 2020 = \_\_\_\_\_ [1]**





**(b) Boris says:**

**‘It is clear that humans are to blame for all these extinctions. The more the human population increases, the more species become extinct.’**

**(i) Explain one reason why species extinctions increase as the human population increases.**

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**[2]**

**(ii) Suggest and explain which part of Boris’ conclusion is likely to be incorrect.**

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**[1]**

**(c) Scientists try to prevent species becoming extinct.**

**Which of the following are reasons why scientists do this?**

**Put ticks (✓) in the boxes next to the TWO best reasons.**

**Preventing extinctions is easy to do.** ☐

**Many plants and animals are dangerous.** ☐

**Biodiversity is important for sustainability.** ☐

**Scientists always work together in teams.** ☐

**Some plants and animals provide us with vital resources.** ☐

**[2]**

**[TOTAL: 8]**

**8 There is a huge variation of life on Earth.**

**The processes of natural selection and selective breeding have been involved in producing this variation.**

**Compare natural selection and selective breeding.**

**Include the similarities and differences between the two processes. [6]**



**The quality of written communication will be assessed in your answer.**

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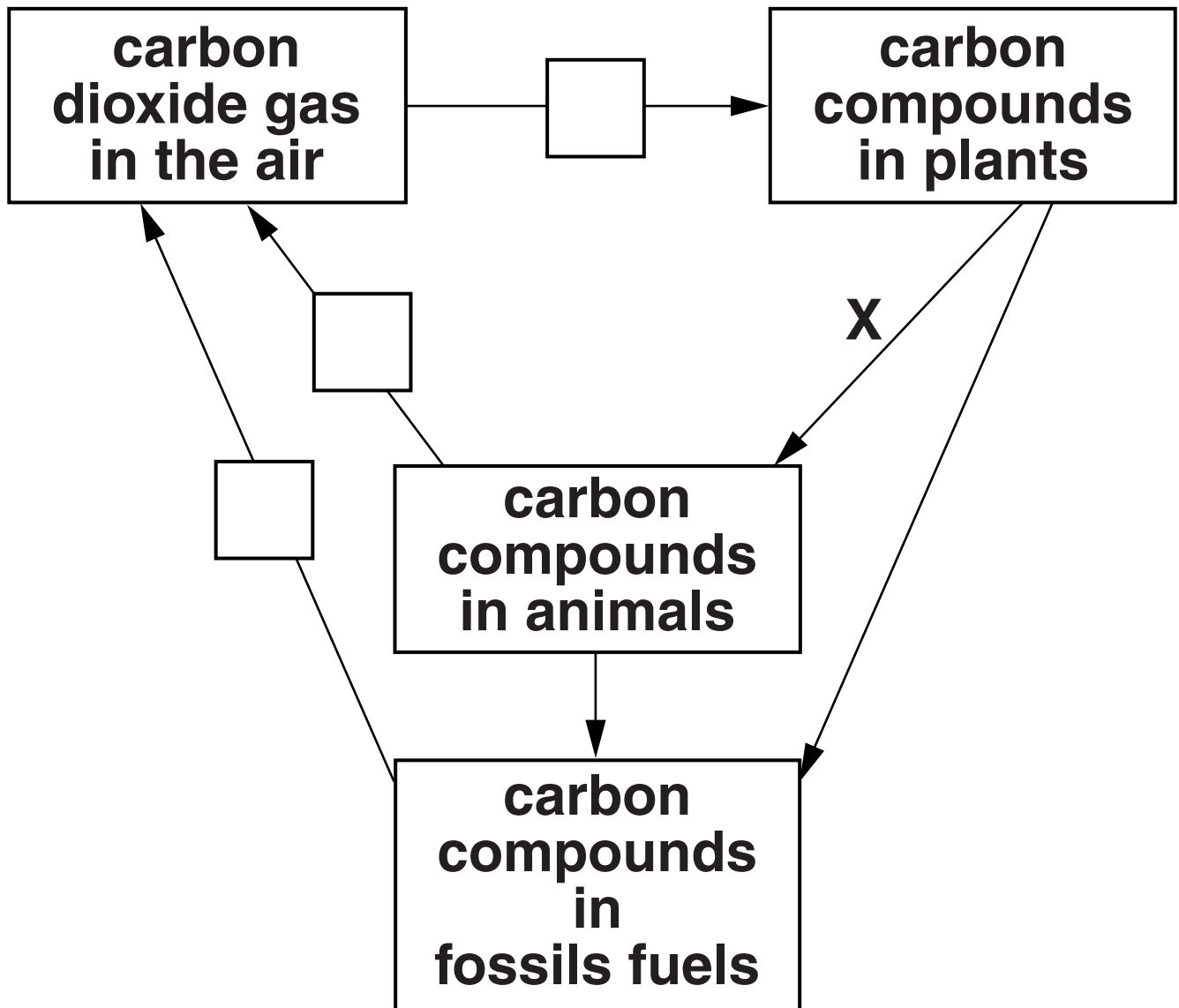
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**[TOTAL: 6]**

**9 The diagram shows parts of the carbon cycle.**



**(a) Three different processes are involved:**

**A combustion**

**B photosynthesis**

**C respiration.**

**Write the letters A, B and C in the correct boxes to complete the diagram.**

**[2]**

**(b) Explain what is happening at arrow X.**

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**[2]**

**(c) Microorganisms have a very important role in the carbon cycle.**

**Describe the role of microorganisms in the carbon cycle.**

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[2]

**[TOTAL: 6]**

**END OF QUESTION PAPER**



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